

THREE NEW ANNUAL SUNFLOWERS (HELIANTHUS)
FROM THE SOUTHWESTERN UNITED STATESCHARLES B. HEISER, JR.¹

I. A NEW AND POSSIBLY EXTINCT SUNFLOWER FROM TEXAS

Helianthus paradoxus, sp. nov. Herba annua, 15 dm. alta, caule sparse scabra, foliis oppositis supra, alternis infra, laminiis inferioribus lanceolatis basi cuneatis, 10 cm. longis, 2.5 cm. latis, profunde 3-nervis, integris, scabris, petiolis 2 cm. longis, pedunculis 3-5, 12-18 cm. longis, phyllariis 16-20, ovato-lanceolatis vel lanceolatis, sparse hispidis, 10 mm. longis, 3 mm. latis, disco ca. 1.8 cm. diam., radiis ca. 15, 1.7 cm. longis, 0.7 cm. latis, corollis disci purpureis, paleis receptaculi ad apicem glabris. TEXAS: Pecos Co., 7 mi. west of Ft. Stockton, Sept. 11, 1947, *H. R. Reed* (type, US; isotypes, GH, SMU).

The new species appears to be most closely related to *H. petiolaris* and *H. annuus*. Its most distinctive feature is the strongly 3-nerved lanceolate leaves. The multicellular bases of the hairs on the upper surface of the leaf give it a distinct punctate appearance. In addition to the leaf shape, the new species is readily distinguished from *H. annuus* by the smaller heads, the nearly glabrous stem, and the narrower phyllaries, and from *H. petiolaris* by the glabrous chaff. The tap root is poorly developed and its similarity to that of *H. agrestis*, a species of low wet places, suggests that it may be a paludose species.

I have waited several years to describe this species in hopes of obtaining additional material. In 1955 an intensive search was made for this plant in the area around Ft. Stockton. Seven miles west of town presumably where the type was collected, there is a low marshy area which I visited in August. Although it may have been too early for the species to be in flower, I found nothing resembling this species in vegetative condition. The area was almost completely covered with the dead stalks of another *Helianthus*, however. A few seeds were secured from dried heads and all of them gave rise to plants of *H. annuus*. In 1957 Dr. Raymond Jackson visited this area and also found no sunflowers other than *H. annuus*.

Two other specimens (*Baker 2*, GH, TEX) have been seen from Fort Stockton which are rather puzzling. These plants

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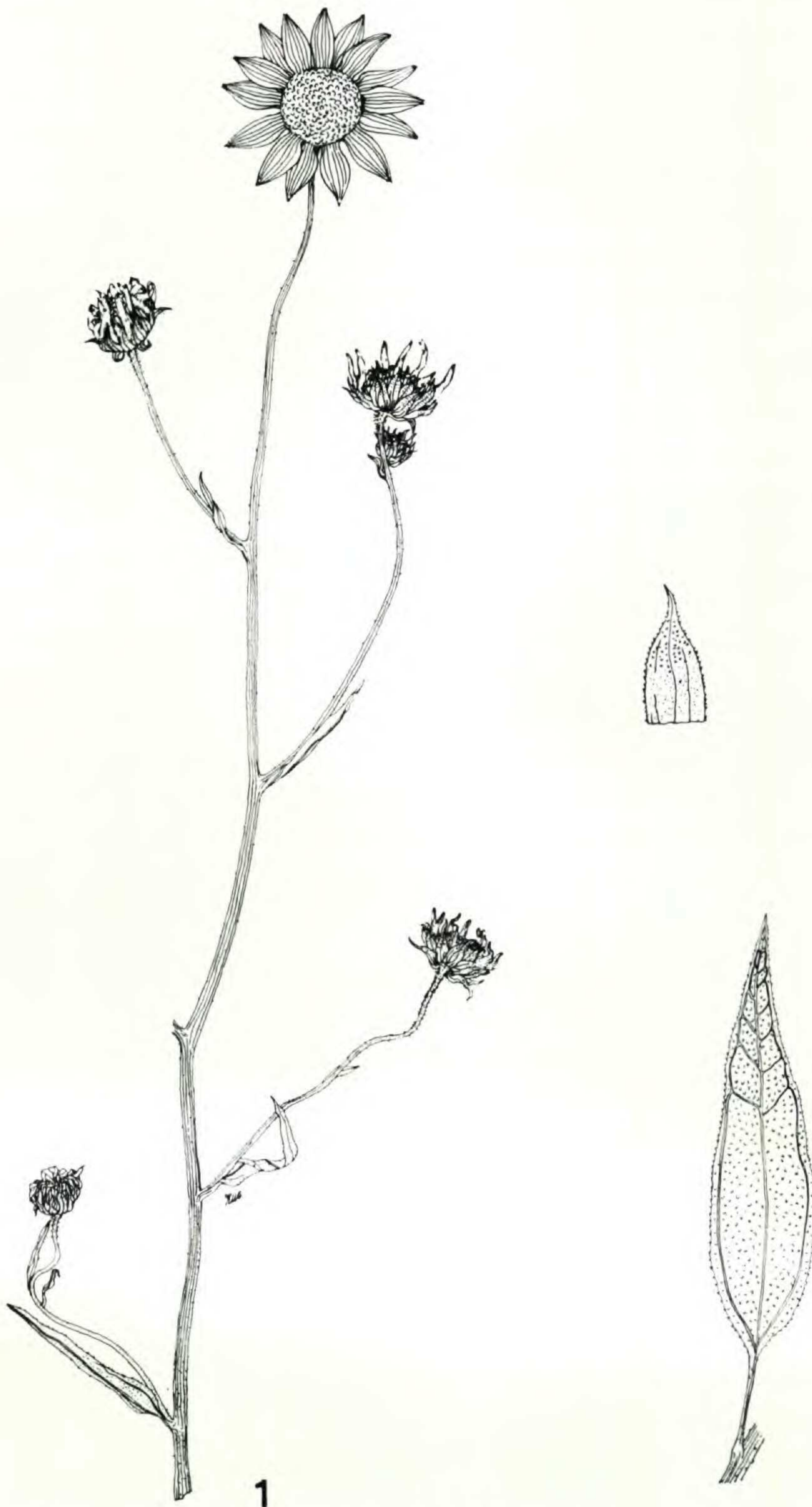


FIG. 1. *Helianthus paradoxus*. Branch and leaf, x $\frac{1}{2}$; phyllary, x $1\frac{1}{2}$. Drawing by Ruth Smith.

are rather similar to *H. paradoxus* but are taller, much branched and have larger heads and leaves (blade 13 cm. x 5 cm.) Examination of the pollen in several flowers revealed the number of stainable grains to range from 2 to 37% in contrast to the 98% of *H. paradoxus*. In addition, over one half of the achenes in the head were unfilled. It seems likely that these plants are hybrids with *H. paradoxus* as one parent and probably *H. neglectus* as the other. The latter is not known to occur in this area, however, although it is known from Monahans, Texas, a short distance to the northwest. On morphological grounds it appears less likely that the second parent could be *H. annuus* which, however, is abundant in the Ft. Stockton area.

The specimen here designated as *H. paradoxus* was identified by me some years ago as *H. praetermissus* E. E. Wats., chiefly on the basis of a specimen which I at that time thought was an isotype of *H. praetermissus* (Heiser, 1952). Subsequent examination of the type of this species based on a collection from the Sitgreaves Expedition, "head of Rio Laguna" Sept. 27, 1851, and a collection labeled "Nay Camp, Rio Laguna, N. M., August 26, 1851" (Valencia Co.) convinced me that they belong to two different species. The latter material appears to be the same as *H. paradoxus*, differing from the type only in slightly narrower phyllaries and longer petioles. *Helianthus praetermissus* differs from *H. paradoxus* by its very narrow, sessile hirsute leaves. The type specimen of *H. praetermissus* is very fragmentary and no roots are present so it is not known whether it is an annual or perennial.

No specimens of either of these New Mexican sunflowers have been secured since the original collection in 1851. It may be that both are extinct. Río Laguna, now Río San José, and the pueblo of Laguna derived their names from a lake which now has disappeared. It is possible that these species were marsh plants which grew near the lake. I have made brief excursions into this region during two summers and have found only *H. annuus* and *H. petiolaris*, and Dr. Raymond Jackson of the University of New Mexico who has made special efforts to collect all of the species of *Helianthus* of New Mexico has so far not encountered either *H. paradoxus* or *H. praetermissus*.

II. DESCRIPTION AND CYTOGENETICS OF A SECOND NEW SUNFLOWER
FROM TEXAS

In 1950 Theodore Odell in a search for *Helianthus paradoxus* for me brought back seeds of a sunflower from near Monahans, Texas. It was clearly evident that the plants grown from these seeds represented a new sunflower obviously closely related to *H. petiolaris* Nutt. In 1955 I was able to visit this area and I found these sunflowers growing in scattered colonies along Highway 80, ten miles east of Monahans to within two miles of the city.

Helianthus neglectus, sp. nov. Herba annua, 8–15 dm. alta, caule dense hispido infra, ramoso supra, foliis inferioribus ovatis, plerumque cordatis ad basim, subintegris vel serrulatis remote, sparse hispidis, pilis propiter appressis, laminis 7–14 cm. longis, 7.5–12.3 cm. latis, petiolis 9–11 mm. longis, pedunculis 10–40 cm. longis, phyllariis 25–35, lanceolatis, attenuatis 15–24 mm. longis, 2.5–4.0 cm. latis, disco ca. 2.3–2.8 cm. in diam., radiis 21–31, 3.0–3.9 cm. longis, 1.0–1.4 cm. latis, palei centrale receptaculi ad apicem albo-hirsutis. TEXAS: Ector Co., 10 miles east of Monahans, July 22, 1955, *Heiser 4123* (type, IND).

It seems somewhat arbitrary whether this sunflower is treated as a species or as a subspecies of *H. petiolaris*. It does not intergrade with the latter, but it is closely related as can be seen from the densely white pubescent chaff tips in the center of the head and most of the other characteristics. It differs from it, however, in the very long attenuate phyllaries, the larger heads, the broader, and frequently, cordate leaves, the densely hispid-hirsute lower stems, and the fact that the branches come off at a greater angle. The two species are allopatric, with *H. petiolaris* having a wide distribution over the western half of North America, and extending within 60 miles of *H. neglectus* in Martin Co., Texas. The new species grows in a more xerophytic area than does *H. petiolaris* in the Texas area.

The cordate leaf of *H. neglectus* is similar to that of certain races of *H. annuus* and *H. debilis*. *Helianthus debilis* occurs in eastern Texas and *H. annuus* is common throughout Texas, but no plants of these two species were seen growing in the area of *H. neglectus*. That *H. neglectus* owes its origin to past hybridization between *H. annuus* and *H. petiolaris* is a possibility, but it appears more probable that the new species differentiated from the same gene pool as *H. petiolaris*. The angle of branching in



FIG. 2. *Helianthus neglectus*. Branch and leaf, x $\frac{1}{2}$; phyllary, x $1\frac{1}{2}$.

H. neglectus is unique and is most nearly approached by that of *H. paradoxus* of Pecos County, Texas.

The new species has been crossed with *H. annuus* and with two or more races of both *H. petiolaris* and *H. debilis*. The hybrids (Table 1), generally ten plants of each combination except in 5783b where only one hybrid plant was secured, were grown in the experimental garden at Bloomington. Pollen grains for several plants in each culture were stained in cotton blue and those taking a deep stain were counted as "good". Seed set was estimated by examining the number of filled achenes in several heads in each plant and in general, the percentage of filled achenes was about of the same order as the percentage of "good" pollen. All of the species included in the hybridization program are diploid ($n = 17$). Aceto-carminic smears of the pollen mother cells from one plant of each of the hybrids were made and chromosome pairing was examined at diakinesis. Crosses of sister plants of all the species were made and were found to give fertile progeny with the expected 17 pairs of chromosomes. The results of the cytological survey are given in Table 1.

HYBRIDS WITH *H. PETIOLARIS*.—*Helianthus petiolaris* comprises two cytogenetic races: race A from the central and western United States and race B from the southwestern United States (Heiser, unpubl.). Crosses of *H. neglectus* with both races give F_1 hybrids with varying degrees of sterility and from the examination of meiosis it is clear that they both differ from *H. neglectus* by at least one translocation. The hybrids involving race B generally show higher pollen fertilities although a few cells in these hybrids showed the presence of two chains of four which would imply a difference of two translocations.

The single hybrid secured with *H. petiolaris* var. *canescens*, a taxon found from southwestern Texas through southern Arizona to northern Mexico, shows even greater sterility and indicates considerable structural differences in the chromosomes of the two parents.

HYBRIDS WITH *H. ANNUUS*.—Ten plants of the hybrid, *H. neglectus* x *annuus* were grown with *H. neglectus* as the female parent. The reciprocal cross failed. Pollen fertility was quite low and some heads failed to produce a single filled achene.

TABLE I. POLLEN FERTILITY AND CHROMOSOME PAIRING IN F₁ HYBRIDS OF *H. neglectus* WITH OTHER SPECIES

Culture Number	<i>H. neglectus</i> ×	Range of Stainable Pollen	No. of Plants Examined for Pollen	17 II	No. of Cells at Diakinesis with:						11 II VI VI
					15 II	15 II	14 II	13 II	12 II	12 II	
5781	<i>petiolaris</i> A Gary, Ind.	43, 44%	2	15	15 II	15 II	VI	IV IV	IV VI	11 II VI VI	
5627a	<i>petiolaris</i> A St. Louis, Mo.	22-28%	3	1	17	2					
5627b	reciprocal	14-35%	5	4	3	16					
5247a	<i>petiolaris</i> B Amarillo, Tex.	28-39%	3	10	16	11		2?			
5782	<i>petiolaris</i> B Shamrock, Tex.	35, 37%	2	3		12		2?			
5626b	<i>petiolaris</i> B Acoma 1, N. M.	49-79%	4	3	3	12					
54-46:42	reciprocal	55-80%	6	1		7		2			
5561a	<i>petiolaris</i> B Acoma 2, N. M.	24% 27-77%	1 6	4		6					
5783b	<i>petiolaris</i> var. <i>canescens</i> Dona Ana Co. N.M.	9%	1						1	5	
5248a	<i>annuus</i> St. Louis, Mo.	2, 3%	2								
5420a	<i>debilis</i> ssp. <i>cucumerifolius</i> Gonzales, Tex.	12-21%	7			1	2	3	1	2	
5420b	reciprocal	16-21%	8								
5526a	<i>debilis</i> ssp. <i>praecox</i> Galveston, Tex.	60-81%	3	4		10	9	2			
5526b	reciprocal	46-68%	3	4		10	9	2			

* Occasional cells with 15 II III I have been lumped with the 15 II IV category for convenience.

Meiosis was examined in one plant but the configurations could not be determined with certainty although it was apparent that one or more chains were present. These hybrids, in general, are rather similar to those of *H. annuus* x *petiolaris*.

HYBRIDS WITH *H. DEBILIS*.—*Helianthus debilis* has been shown to comprise two cytogenetic races (Heiser, 1956). Representatives of one group of subspecies, including *H. debilis* subsp. *praecox*, when crossed with *H. neglectus* give F₁ hybrids with higher fertilities than does the second group, which includes *H. debilis* subsp. *cucumerifolius*. Similar results are secured in crosses of *H. petiolaris* with these subspecies.

III. A NEW SUBSPECIES OF *H. PETIOLARIS*

Recent field work combined with garden and herbarium studies has convinced me that the southwestern representatives of *H. petiolaris* are quite different from the typical element of the species. Crosses of the new subspecies have been made with several races of *H. petiolaris* subsp. *petiolaris* and it has been found that some of the resulting hybrids are fertile whereas others show some sterility. It seems desirable to put the subspecies on record at the present time, although a detailed discussion of the variation and cytogenetics will be deferred until later.

***H. petiolaris* subsp. *fallax*, subsp. nov.** Herba annua, 0.5–2.0 m. alta, caule hispido vel glabro raro, rubro vel viride, ramoso supra; foliis inferioribus lanceolatis vel deltoideolanceolatis, serratis vel integris, 6–15 cm. longis, 1–6 cm. latis; pedunculis 5–40 cm. longis, phyllariis 12–20 mm. longis, 3–4 mm. latis, plerumque hispidis, glabris vel hirsutis raro, columnis antheris rubris vel purpureis.

Distribution:² western Colorado to Utah south to New Mexico and Arizona, 4000 to 8000'; June to Sept. ARIZONA: Apache Co., Painted Desert, July 25, 1955. *Heiser 4149* (Type, IND); Coconino Co., *Eastwood and Howell 6925* (US); Cochise Co., *Blumer 1488* (NY); Gila Co., *Harrison and Kearney 8294* (US); Pima Co., *Chondhri 60* (IND); Navajo Co., *Heiser 4164* (IND); Yavapai Co., *Peebles et al 4291* (US). COLORADO: Moffat Co., *Heiser 4540* (IND); Montrose Co., *Walker 152* (GH, US). NEW MEXICO: Bernalillo Co., *Jackson 2101* (UNM); Chaves Co., *Griffiths 5685* (US); Colfax Co., *Heiser 4171a* (IND); Dona Ana Co., *Dunn 5350* (UNM); Eddy Co., *Whitehouse 16809* (US); Grant Co., *Metcalfe 763* (GH, NO, NY, US); Quay Co., *Fisher 35* (US); Rio Arriba Co., *Jackson 744* (UNM); San Juan Co., *Jackson 2485-2* (UNM); San Miguel Co., *Standley 5041* (MO, NY);

² One specimen from each county is cited. The herbarium abbreviations used are those recommended in *Index Herbariorum*. I would like to express my thanks to the curators of the herbaria cited for making the specimens available for study.



FIG. 3. *Helianthus petiolaris* subsp. *fallax*. Branch and leaf, x $\frac{1}{2}$; phyllary, x $1\frac{1}{2}$.



FIG 4. *Helianthus petiolaris* subsp. *petiolaris*. Branch and leaf, $\times \frac{1}{2}$; phyllary, $\times \frac{1}{2}$.

Sante Fe Co., *Heller 3785* (MO, NY, US); Socorro Co., *Dunn 5090* (UNM); Torrance Co., *Heiser 4509* (IND); Valencia Co., *Weatherwax* (IND). UTAH: Emory Co., *Stoutamire 2602* (IND); Garfield Co., *Piranian* (UTC); Grand Co., *Holmgren and Hansen 3288* (GH, NY); Kane Co., *Heiser 4512* (IND); San Juan Co., *Heiser 4154* (IND); Uintah Co., *Rollins 1725* (GH, MO, NY); Utah Co., *Jones 509* (GH); Washington Co., *Jones 5257* (MO, US); Wayne Co., *Stoutamire 2592* (IND).

Helianthus petiolaris subsp. *petiolaris*³ which is found from Wisconsin to British Columbia, south to Texas, and occasionally adventive elsewhere, is from 0.5 to 1.4 mm. tall, more branched and spreading with stems usually green, rarely red, strigose, or somewhat hispid near base, lower leaves usually oblong lanceolate to deltoid-lanceolate, usually not over 12 cm. long by 6 cm. wide, peduncles shorter, phyllaries ovate-lanceolate to lanceolate, 10–14 cm. long, 3.5–5.5 mm. broad, strigose, and anthers usually purple, rarely red.

The new subspecies is extremely variable as can be seen from the description. From garden cultivation it is apparent that some of the variation in nature must be environmental modification of the phenotype although a great deal of genetic variability is also present. In the eastern part of its range it grades into *H. petiolaris* subsp. *petiolaris* and in the south into *H. petiolaris* var. *canescens* A. Gray. In its extreme form it is, however, very distinct and if it were not for the presence of intermediates I would consider it a distinct species. The generally longer, narrower phyllaries and the hirsute stem are perhaps the most reliable characters to separate it from *H. petiolaris* subsp. *petiolaris*; from *H. petiolaris* var. *canescens* it is most readily distinguished by a hispid rather than a canescent pubescence.

SUMMARY

Two new species and one new subspecies of *Helianthus* are described: *H. paradoxus* from Pecos Co., Texas and Valencia Co., N. M.; *H. neglectus* known only from Ector Co., Texas; and *H. petiolaris* subsp. *fallax* from Colorado, Utah, New Mexico and

³ Nuttall (p. 115, 1821) gives "on the sandy shores of the Arkansa" as the type locality. Watson (1929) cites a collection by Nuttall from the "Upper Missouri River" in the Academy of Natural Science at Philadelphia as the type. I have examined this specimen and also a photograph of a Nuttall specimen from the British Museum labeled "Arkansa" and the latter certainly must be regarded as the type. It is clear from Nuttall's account in his Journal, however, that the specimen was collected in what is now northeastern Oklahoma.

Arizona. Artificial hybrids of *H. neglectus* with several other species are discussed.—DEPARTMENT OF BOTANY, INDIANA UNIVERSITY, BLOOMINGTON, IND.

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DESCRIPTION, DISTRIBUTION AND ECOLOGY OF
THREE SPECIES OF VAUCHERIA PREVIOUSLY
UNKNOWN FROM NORTH AMERICA

JOHN L. BLUM AND ROBERT T. WILCE

During the period from June to November, 1955, a survey was made of the distribution and ecology of attached marine algae along the coast of the Labrador peninsula. Collections were made from the mouth of the Koksoak River, Quebec, northward along the western side of the Labrador peninsula to Port Harvey, Killinek Is., Quebec, and in a less extensive area in the regions of Hebron and Saglek, Labrador. Collected materials from the mouth of the Koksoak River and False River Bay, Quebec, show three species of *Vaucheria* previously unknown from North America.¹

The writers express their gratitude to Dr. I. Mackenzie Lamb, Director of the Farlow Library and Herbarium, Harvard University, for the loan of the type material of *Vaucheria compacta* (Collins) Collins, and to Dr. David Irvine, who provided preserved material of *V. sphaerospora* Nordstedt collected in Scotland.

Intertidal areas of southeastern and southwestern Ungava Bay, especially at the heads of fjords and bays and near the mouths of larger rivers and streams, take the form of broad,

¹ Specimens of the described species have been deposited in the New York Botanical Garden and the herbarium of the University of Michigan.